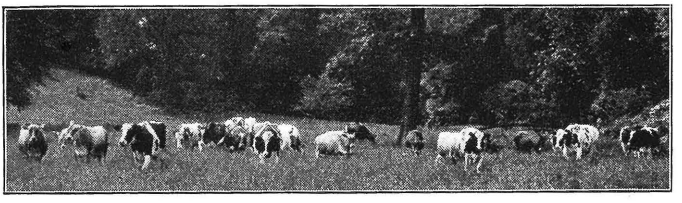
DAIRY WORK

EXPERIMENTS UNDER WAY AND REFERENCES TO COMPLETED WORK AND PUBLICATIONS OF THE DEPARTMENT OF DAIRY INDUSTRY

AUGUST 24, 1928



OHIO AGRICULTURAL EXPERIMENT STATION

Wooster, Ohio

Circular No. 13

DAIRY WORK

Experiments Under Way and References to Completed Work and Publications

DEPARTMENT OF DAIRY INDUSTRY

THE DAIRY HERD

The Station dairy herd consists of about 90 purebred Holsteins and Jerseys. There are now (Aug. 1, 1928) 48 female and 4 male Holsteins and 33 female and 2 male Jerseys; 40 females are of milking age.

The herd is kept primarily for experimental purposes, and therefore can not be a model or show herd. It is impossible to maintain a herd under model conditions and use the animals for the various necessary feeding experiments, some of which may even prove seriously detrimental to the well being of the animals.

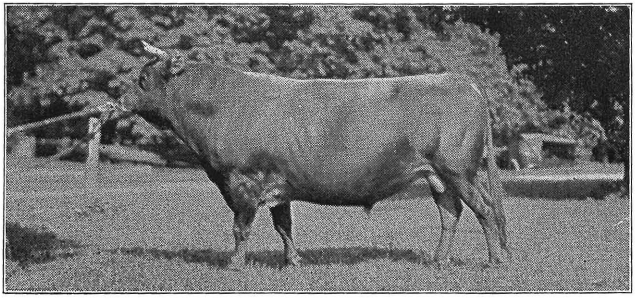


Fig. 1.—Choice Owl 175407

A complete record of all feeds consumed by each animal, except water and pasture, is kept from the time the animal arrives in the herd until its disposal. The milk at each milking is weighed and the weight recorded. Each animal is weighed at least twice a month. These require a large amount of record work. As many as 2,500 separate items may be entered for one cow in a year, the number depending on the experiment. Much more labor is called for than in a commercial dairy.

Some testing for Advanced Register and Register of Merit is done when it does not interfere with an experiment. (See page 16).

Small dairy herds are also maintained on the Trumbull, Hamilton, and Belmont County Experiment Farms.

EXPERIMENTS UNDER WAY

SELECTION OF SIRES

Can a high class herd be built up and maintained by the selection of young untried sires without the purchase of new females?

This work has been going for 20 years and comprises the entire herd. Additional data are available from the county herds.

Of five Jersey sires, bought as calves, one injured the herd greatly in both type and production, one failed to make any real improvement in type and very little in production, two improved the herd, and the fifth promises to make a still further improvement. Of five Holstein sires selected in a similar manner, three improved the herd in type and production, one failed to make improvement, and one injured the herd.

These sires were carefully selected but high prices were not paid except in one case. Excluding this one the highest price paid was $250.

Similar results have been reported by other experiment stations and by agricultural colleges. Much the same results were obtained with the foundation females. The progeny of some cows have been good in spite of the sires, and the progeny of others poor. Some undesirable sires will be obtained even under the most careful selection. The breeding of dairy cattle is a somewhat difficult game won only by those who are most careful in the selection of males and foundation females.

To start with 10 scrub breeding cows and good bulls will require 7 years to get 11 good cows. In the meantime 10 profitable and 30 unprofitable yearly records probably will have been made. To start with 2 good foundation cows and good bulls will require 7 years to get 10 good cows. In the meantime 36 profitable and no unprofitable yearly records probably will have been made. Partial reports of this work were published in the Bimonthly Bulletin for July, 1916, May-June 1925, Jan.-Feb. 1926.

GRINDING ROUGHAGE FOR COWS

An experiment was conducted during the winter of 1926-27 to get information on the value of grinding roughages.

Two lots of six cows each were fed from November 15 to May 10. The roughage was alfalfa hay and corn stover. One lot received the alfalfa whole and the stover cut in about one inch lengths. The other lot received both alfalfa and stover ground

rather fine. Both lots received the same grain mixture, which consisted of 6 parts corn, 4 parts oats, 2 parts bran, and 1 part linseed oilmeal. Each cow received 2 pounds of molasses daily on the roughage and was allowed all she would clean up in the proportion of 6 parts grain, 6 parts hay and 3 parts stover. The rations were reversed on the lots February 1.

The data collected 8 weeks before the change of rations and 8 weeks after (allowing two weeks for the cows to become accustomed to the change) were taken for comparison. The cows receiving unground roughage consumed 11,219 pounds and those receiving the ground roughage 11,355 pounds, or 136 pounds more of the ground roughage. This difference was mainly due to the fact that some of the coarse parts of the stover were refused.

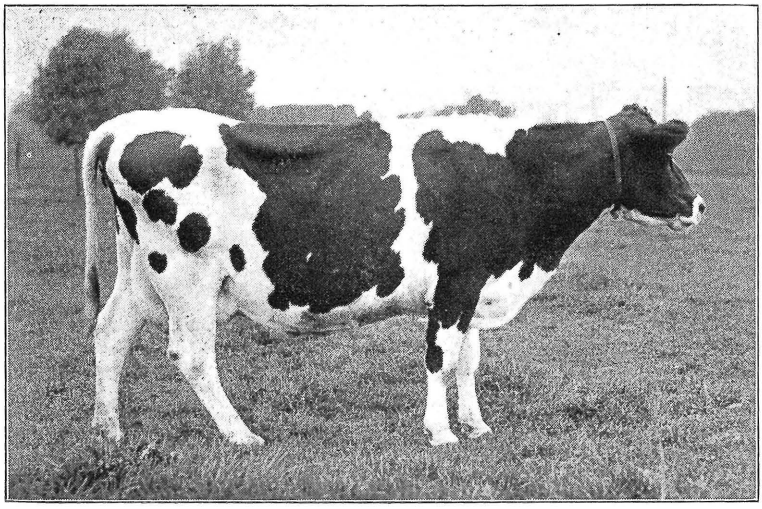


Fig. 2.—A good foundation cow and four generations (Fig. 3) of her progeny

The cows on ground roughage produced 18,191 pounds of milk; those on unground roughage, 17,645, a difference of 546 pounds, or 3.1 percent in favor of the grinding. This difference is so small that it falls within the possibility of error and is not really significant. Since 5.67 tons of the ground roughage was consumed, if the gain in milk could all be attributed to the grinding, it would amount to 95 pounds of milk per ton of roughage ground. But since the difference is no greater and since some cows produced more on the unground roughage, we can not fairly attribute the gain to the grinding. More tests are needed to confirm the results. This difference would little more than pay for the cost of grinding.

The Michigan Station found similar results with ground alfalfa but not enough gain to pay for the grinding. Mississippi Station found practically the same for ground soybean hay. Pennsylvania got similar results with ground alfalfa and reports that fine grinding reduced the digestibility of the crude fiber.

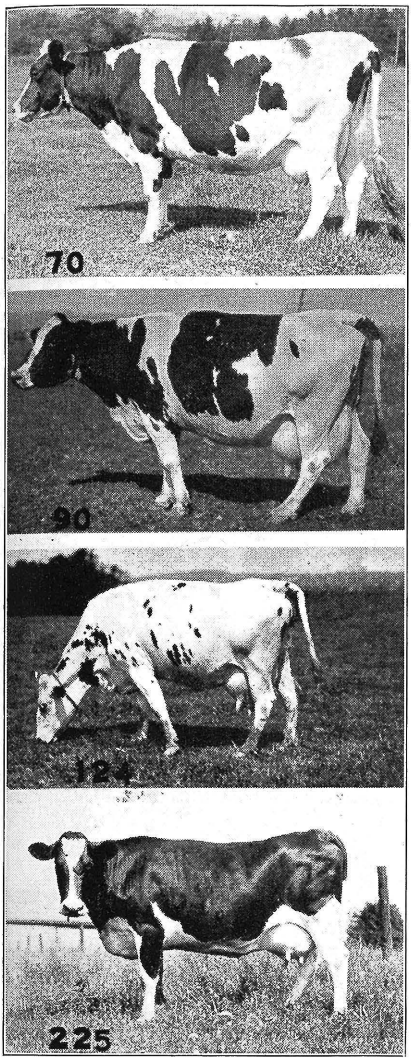


Fig. 3.—Average of the best records of the five generations 18,375 pounds milk and 657 pounds butterfat

MIXING GRAINS WITH GROUND ROUGHAGES

This experiment, conducted during the winter 1927-28, was planned to determine the effect on palatability and digestibility due to mixing grains with ground roughage. The claim has been made that more complete digestion of grains is obtained if they are mixed with the cut or ground roughage, and pass into the rumen.

Two groups of six cows each were started in the experiment. Both groups were fed the same grain mixture and ground hay from the same source. One group received the grain and hay separately, while the other received them thoroly mixed together. The grain consisted of 4 parts corn, 3 parts oats, 3 parts bran, and 2 parts linseed oilmeal, by weight. The hay consisted of equal parts, by weight, of number one alfalfa, clover, and timothy, ground thru a 7/16-inch screen in a hammer mill. No molasses was sprinkled over the ground hay to make it more palatable. The hay was fed dry from January 1 to April 15.

Previous to the experiment the cows received a similar grain mixture, a good quality of alfalfa hay, and corn silage. When the change to the ground hay was made several of the cows did not eat it well for some days. At the end of the first month one cow refused to take it and had lost 83 pounds in weight. Some of them were induced to eat liberal amounts for a time but most of them were off feed at some time during the experiment. Several lost weight rapidly and took on an unthrifty appearance. The average loss of weight per cow in Group 1 was 76 pounds; and in Group 2, 80 pounds. No digestion test was made but the condition of the cows and their feces showed that digestion was not good.

The rations were switched on the groups on March 1. The data for five weeks before the change and five weeks after were used for comparison. During this time the consumption of feeds was as follows:

	Grain, pounds	Hay, pounds
Cows receiving the unmixed ration	4158	5950
Cows receiving the mixed ration	4478	6746
Difference	320	796

This shows that more was eaten when the grain and roughage were mixed together and indicates that mixing increased the palatability somewhat. However, four of the cows ate more of the unmixed. The milk production was as follows:

Cows on unmixed grain and roughage	9469 pounds
Cows on mixed grain and roughage	9426 pounds
Difference	43 pounds

This is a very small difference and shows no advantage for the mixing.

From April 15 to May 1 the hay was soaked from one feeding to the next with an equal weight of water; during May the amount of water was doubled. The cows ate it somewhat, but not markedly, better when wet. Toward the close of the experiment, a second cow refused it for four days and was dropped from the test. The grinding seemed to reduce the palatability of the hay. The dry, ground hay fed liberally seemed to be seriously detrimental to the cows' digestion and hence to their production.

A STUDY OF PROCESSED ROUGHAGE

Systems of processing, or "Predigesting", roughages have been promoted in Ohio during the last few years. Extravagant claims have been made for these processes, some of which are: a 50 percent

saving of feeds, making roughages equal to grains, reducing the grains one-half, breaking down crude fiber, changing carbohydrates to sugars, changing starches to sugars.

Ten farms where outfits were installed for processing were visited and the process studied. Reports were obtained from other farms. Samples of roughage were taken before and after processing, and brought to the Station for analysis. Other samples were brought in by farmers. Samples were taken from apparatus being used by the Department of Animal Industry in a test with steers. All samples showed approximately the same results. No reduction of fiber has been found and no change of carbohydrates to sugars. The average of ten samples follows:

	Original roughage, percent	"Predigested" roughage, percent
Crude fiber present	24.72	24.37
Reducing sugar present	1.66	1.90

In some cases there was slightly less sugar in the finished product than in the original.

The following are reasons why the analyses show such results: (1) No economic method has yet been devised whereby crude fiber can be converted to sugar. Diastase, which is the active agent used in these processes, will not do it. (2) Diastase will, under proper conditions, change starches, especially cooked starches, to sugars, but farm roughages contain almost no starch. The most common method of determining starch includes also pentosans and galactans. The so-called starch of roughages consists almost entirely of these materials, neither of which is acted on by diastase. (3) For some of the processes the recommendation is to heat the feeds with steam after the digester is added. A sufficiently high temperature is reached by this process to kill the diastase.

No practical test with dairy cows has been made by the Station. However, the Department of Animal Industry conducted a test with steers and found no gain for the process over the same feeds processed without the digester or not processed at all. The Wisconsin Station reports unfavorable results when processed feeds were fed to horses and no advantage with cows. A Canadian Station reports much the same results. It has been our observation that farmers using the process abandon it sooner or later. This shows that it is not proving profitable.

If grains are added to the roughage and the whole cooked before the digester is added and the temperature kept right, there

will be some conversion of the starch from the grains to sugars. It is doubtful, however, if this is of any digestive assistance to the cow. She is well equipped to change starches to sugars in the digestion process. Rats fed such feeds, converted in the laboratory, made no better growth than others fed the same feeds without the starch being changed. This subject needs considerably more investigation.

THE EFFECT OF RATIONS EXTREMELY HIGH IN PROTEIN

Cows 154, 292, 332, and 329 are now being used in this test. The present ration consists of

16 parts by weight of alfalfa hay
16 parts by weight of corn silage
12 parts by weight of grain mixture

The grain mixture consists of equal parts linseed oilmeal, cottonseed meal, corn gluten meal, soybean meal, peanut meal, wheat bran, blood meal, and wheat gluten; it contains about 40 percent digestible protein. The air-dry matter of the entire ration contains about 20 percent digestible protein. The ingredients in the ration are changed somewhat from time to time.

THE EFFECT OF RATIONS EXTREMELY LOW IN PROTEIN

Cows 264, 293, and 301 are receiving the following ration:

10 parts by weight of timothy hay
30 parts by weight of corn silage
1.5 parts by weight of molasses (fed on the hay)
10 parts by weight of grain mixture

The grain mixture consists of 66 2/3 percent corn, 11 1/9 percent each of oats, bran, and starch. It contains about 6.75 percent and the air-dry matter of the entire ration contains about 4.2 percent digestible protein.

The cows on these extreme rations have not taken them readily. They have not kept in good condition, the milk flow has been reduced, and they are failing to breed properly. Two cows had to be removed from the low protein ration to save their lives. The upper and lower limits have been passed in these two extreme rations. However, the chemical composition of the milk has remained remarkably constant. Earlier work with less extreme rations showed that the proportion of protein in the ration had much less influence on the condition of the cow and on production than was commonly supposed. The results obtained over a long

time with rations varying in nutritive ratio from 1:4 to 1:11 were not strikingly different. This line of work has been going for 17 years and is to be continued for a few years more. It is one of the earliest continuous long-time feeding experiments with dairy cattle. The results show that it is possible for cows to get along well with less protein than was formerly thought necessary. This has been confirmed by other investigators. Either extremely heavy or extremely light feeding of protein may be seriously detrimental to animals. The safety zone, so far as the health of the cows is concerned, probably lies between a nutritive ratio of 1:10 and 1:3.5, and the most desirable ratio between 1:5 and 1:7.

Metabolism tests were conducted with some of these cows and additional valuable data secured. Partial results are published in Bulletins 376 and 389.

RATIONS ON THE FOOD VALUE OF MILK

The extremely high and low protein rations fed to cows caused little difference in the food value of the milk compared with milk from cows fed normal rations.

The vitamin-A content of milk from cows fed an excess of protein was slightly greater than that of the milk from cows receiving insufficient protein, due to the higher vitamin-A content of the feeds in the high-protein rations. The same was true with vitamin B. In neither case was the difference sufficient to be of practical importance. Rats were used in these tests.

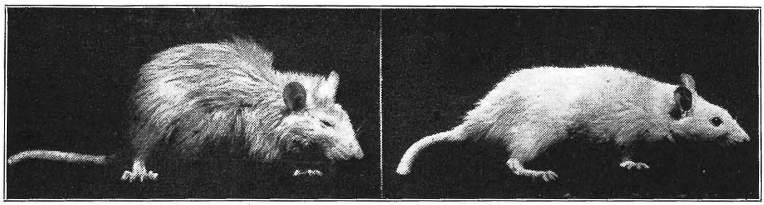


Fig. 4.—Rat fed milk alone

This rat fed milk alone became anemic, hemoglobin content of blood 10 percent of normal.

Fed milk and iron and copper

The same rat after receiving for two months daily doses iron and copper, hemoglobin content of blood 100, or normal.

Calves fed from birth to six months of age showed a daily gain of 1.65 pounds on milk from the high-protein cows and others 1.60 pounds on milk from the low-protein cows.

These results indicate that cows can tolerate an excess or shortage of protein without materially affecting the food value of the milk.

THE LACK OF IRON IN MILK

In the preceding test it was desired to feed rats an exclusive milk diet. This could not well be done because anemia, due to the lack of iron, developed and death followed. The feeding of iron did not prevent it. Other things were tried. A certain kind of yeast proved effective. A later batch of the same kind of yeast and also other kinds of yeast were not effective. It developed that the effective batch contained copper and a large amount of iron. At about this time men from two other stations reported that the addition of iron and a little copper prevented and cured anemia in rats. This permits milk from different cows to be fed alone over a longer period of time, giving a better comparison of its food value. The discovery that copper and iron may prevent anemia may be of much value to human beings.

PROTEIN NEEDS OF COWS ON PASTURE

Three groups of cows were used in this work during the summer of 1926. A grain mixture containing 12 percent of digestible protein and consisting of 2 parts corn, 1 part oats, and 1 part bran gave as good results as another mixture containing 20 percent of digestible protein and a greater variety of grains. Groups of cows are on similar rations during the present summer (1928) but the results are not yet available.

The results of this experiment were reported in the Bimonthly Bulletin for May-June, 1928.

MINERALS FOR COWS

An experiment is being conducted at the Trumbull County Experiment Farm to determine the advisability of feeding a mineral supplement to dairy cows where a good ration is fed. The ration provides a good grain mixture of corn, oats, bran, and linseed oilmeal, together with mixed hay of good quality, and corn silage. The cows are on pasture in the summer. On January 1, 1923, the herd was divided into two groups. Both groups were to be fed and treated alike with the one exception that the grain mixture for one group was to contain 2 percent of calcium phosphate.

Up to the present time, 5½ years, no outstanding differences between the mineral and non-mineral groups have been noted. The

milk production of each group has been good. The best records of the 7 cows in the non-mineral group averaged 10,340 pounds milk as compared with an average of 10,490 pounds for the best records of the 9 cows in the mineral group. This difference of 150 pounds of milk in favor of the mineral group is far from being significant.

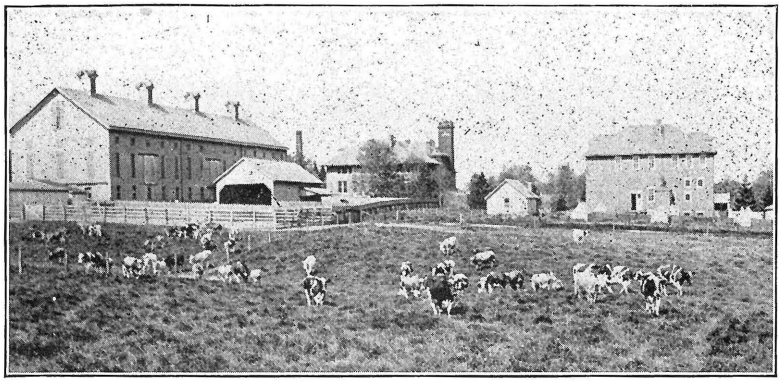


Fig. 5.—These cows received grain while on pasture

There is a slight suggestion in the breeding records of some benefit from the extra minerals. For 23 lactation periods in the mineral group there were required 34 breeding services, an average of 1.5 for each conception. For the 17 lactation periods in the non-mineral group there were 32 breeding services, an average of 1.9 for each conception.

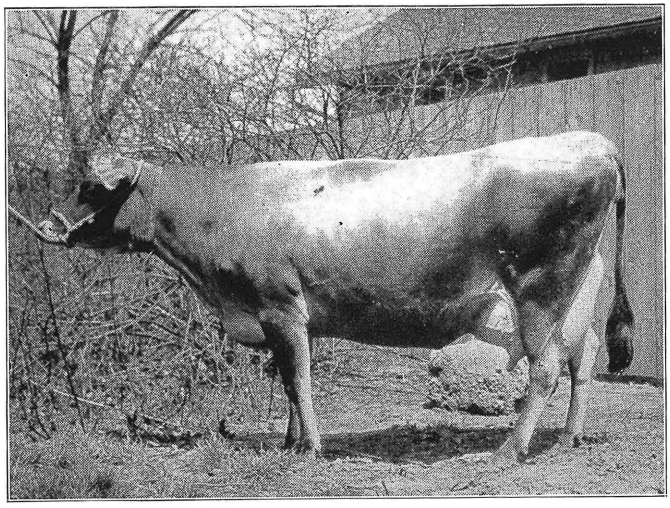
This work is still in progress. More complete information will be published later.

FEEDING IODINE TO COWS

Cows 121, 307, 310, 349, 314, and 327 are being fed iodine. This is a study of the effect of feeding small quantities of iodine to cows on their production and on the iodine content of their milk. Iodine is readily detected in the milk when the cow receives as little as one-tenth of a gram of potassium iodide daily, altho no iodine is detected in the milk of other cows similarly fed, but receiving no iodine.

Some writers have claimed that small amounts of iodine will aid in the assimilation of calcium, phosphorus, and nitrogen; that breeding troubles will be lessened, and the offspring be more vigorous. It has also been claimed that it will result in increased milk production over both short and long periods of time. No

increase in milk production was detected when the iodine feeding began. However, it can be said that the cows which at present are receiving iodine are doing well, and others which have received iodine have done well.



Mio Queen, 631834, age 2 years, 4 months, R. M. record, 8501 pounds milk and 437.28 pounds fat, in 365 days; milked twice a day. Carried calf 211 days. She received 1 gram potassium iodide daily during this lactation and subsequent dry period. Her milk contained iodine (1 part in 10 million). She dropped a 95-lb. calf at the succeeding freshening.

Iodine is injurious if fed in large amounts. Probably it is not best to feed more than one-tenth of a gram per day to a cow. Mineral mixtures or salt containing one-tenth percent of calcium iodide, sodium iodide or potassium iodide are safe to feed.

For a partial report on this work see the Bimonthly Bulletin for July-August, 1928.

CLOVER, ALFALFA, AND SOYBEAN HAYS

Three groups of Holsteins are now on this experiment. They were started when about 7 or 8 months of age. Other groups were on similar rations for a time as heifers. One group was placed on alfalfa hay and ground shelled corn June 1, 1925, and has been continuously on that ration. They made excellent growth as heifers, and during their first year in milk, as two-year-olds, produced an average of 7,104 pounds of milk and 260 pounds of fat. Since they began to produce milk they have not kept in the best of condition.

All three have bred well and have dropped their second calves. The calves seem normal. One of the cows had udder trouble at second calving and has gone off feed. This may or may not be caused directly by the ration.

Another cow was placed on this same ration and, starting four months later, produced 11,276 pounds milk and 351 pounds fat in one year and dropped a fine calf. She was given a small amount of bone black to make good the deficiency of phosphorus. She was not satisfied with the ration and did not keep in the best physical condition. The next year, on the same ration, she started off as well but produced only 7,666 pounds milk and 248 pounds fat. During the fourth month of the second year she suffered a serious udder infection, which continued and finally caused her death, not, however, until she had dropped another calf. The calf was weak and partly blind at birth but recovered later. This may have been due to the infection, which may have been favored by the restricted ration.

A second group of three heifers was started on corn and soybean hay June 1, 1926. They also did well as heifers. One is fresh (Aug. 1) and the others are due in August and December.

A third group was started on corn and clover hay November, 1926. They have made excellent growth as heifers. One heifer from this group was lost, due to a cause other than the ration, and a younger heifer was substituted.

Heifers in all groups have made average or better than average growth as shown by weights and measurements.

No marked difference has been noted in the growth and well being of the heifers on these hays. It will take a few years more to get a comparison of milk produced. The production and condition of the cows indicate that these are not sufficiently complete rations for long-time heavy milk production. (Progress report in July-August, 1925 Bimonthly Bulletin).

DOES LIBERAL FEEDING OF COWS PAY?

Records kept on individual cows have shown that it pays to feed good cows well. Under a moderately good herd-feeding system these cows produced 8,193 pounds of milk and 332 pounds of fat, while under a system of liberal feeding the same cows produced 13,588 pounds of milk and 557 pounds of fat, an increase in production of more than 60 percent. Each dollar invested in extra feed returned $2.50—a very good investment. Similar data from the Trumbull County Experiment Farm herd show that one dollar

for extra feed returned $3.50. Numerous cases recently reported from cow-test association work show that liberal feeding to good cows paid well. It is evident that these results can easily be duplicated in many herds in Ohio and that the system of feeding good dairy cows liberally is backed by sound feeding principles.

The feed consumed by a milking cow is used for two main purposes: to maintain her body, and to produce milk. The amount required to maintain her body is practically the same whether the production is only fair or good. This requirement is filled first and the amount of feed remaining is available for milk production. Consequently when restricted rations are fed there is little remaining for milk production, but when extra feed is given it is directly available for milk production, providing the cow has the capacity to handle the extra feed as well as the ability to turn it into milk, rather than body fat. Where the quantity of home-grown feeds is somewhat limited, it may be found profitable to reduce the size of the herd and feed the remaining cows more liberally. In this way the amounts of feed consumed for maintenance can be reduced by feeding fewer animals, leaving a larger proportion of the feed for milk production. In this experiment there was only slightly less production from 4 cows fed liberally than from 8 cows fed ordinarily. The returns over feed costs were greater from the smaller number of animals fed liberally. No apparent ill effects followed this liberal feeding. However, there is a possibility that too heavy feeding may promote sterility and other bad results if carried over long periods of time. There is a belief among breeders that fat animals do not breed as well as animals carrying less flesh.

SKIMMILK POWDER FOR CALVES

On three of the county experiment farms considerable work is being done on building up and maintaining healthy, high-producing herds by breeding, feeding, the growing of suitable crops, and the improvement of pastures.

At the Trumbull County Farm, skimmilk powder is proving a valuable substitute for whole milk in calf raising. However, where skimmilk is available on the farm it is preferable to the powder. The following table summarizes the results of a recent trial carried over a period of 150 days:

TABLE 1.—Whole Milk, Separated Milk, Remixed Skimmilk, and Dry Skimmilk Powder for Calves

	Whole milk	Separated milk	Remixed skimmilk powder	Dry skimmilk powder
Gain per head, lb.	247	246	275	227
Milk fed, lb.	2022	2609	2687	2795*
Grain fed, lb.	257	302	275	250
Cost of feed, dol.	48.00	26.93	34.35	34.17
Cost of labor, dol.	3.75	11.10	9.00	1.80
Total cost, dol.	51.75	38.03	43.35	35.97

*In terms of liquid milk.

DAILY BUTTERFAT TESTS VS. COMPOSITE SAMPLE TESTS

Composite sampling is the common method used when complete records of individual cows are kept or when milk is delivered to the milk plant daily. Theoretically this method should give a very accurate measure of the average fat content of the milk over the period covered by the sample.

Discrepancies between tests of composite samples and fresh samples led to this comparison. Composite samples from individual cows were collected and preserved with corrosive sublimate tablets, and daily fresh samples were tested and compared. The percent of fat in the composite samples averaged about one-tenth percent lower than the average of the fresh samples. The difference proved to be due largely to the preservative. This difference of one-tenth percent is small, but on a yearly fat record may amount to considerable. This may be illustrated with a record made by a cow which produced 21,177 pounds of milk. According to the preserved composite samples it contained 690.8 pounds of butterfat or 3.26 percent fat. According to fresh-milk test (commonly 2 days per month) it contained 711.24 pounds of fat, or 3.35 percent. This makes a difference of 20 pounds on the yearly record. In 54 out of 55 yearly records the butterfat yield as obtained by the composite sampling system has been lower than the test, based on fresh analyses. The difficulty of keeping composite samples in good condition is also a factor which may help to account for the difference. A more complete report will be published later.

A. R. S. O. AND R. M. TESTING

When it does not interfere with experiments, certain cows are tested for Advanced Registry or Registry of Merit. Many of the records have been made on two milkings daily, and often when cows

were on experimental rations not suited for high production. Some very creditable records have been made. Ten daughters of our present Jersey sire (Choice Owl) have averaged 410 pounds of fat at two and one-half years of age.

TABLE 2.—A. R. S. O. and R. M. Records in the Station Dairy Herd

Cow	Milk	Fat	Milkings	Age		Class	Sire
				Holsteins			
No.	*Lbs.*	*Lbs.*		*Yr.*	*Mo.*		
57	21,171	711	3	11	11	.....	Tina Clay DeKol Lad
65	18,258	533	3	10	9	.....	Tina Clay DeKol Lad
70	17,492	592	3	9	10	.....	Tina Clay DeKol Lad
104	16,416	531	3	7	.....	.....	Marcella Heng. DeKol
107	22,161	753	3	7	.....	.....	Marcella Heng. DeKol
109	15,001	520	2	7	3	.....	Marcella Heng. DeKol
92	19,400	643	3	6	2	.....	Marcella Heng. DeKol
124	20,377	763	3	6	2	.....	Marcella Heng. DeKol
163	15.017	626	3	3	11	.....	Marcella Heng. DeKol
121	15,521	558	3	7	9	.....	Marcella Heng. DeKol
121	16,121	577	3 and 2	11	.....	.....	Marcella Heng. DeKol
161	11,668	365	3	3	4	.....	Marcella Heng. DeKol
170	16,061	562	3	6	6	.....	Marcella Heng. DeKol
197	14,902	525	3	3	6	.....	K. P. DeKol Spring Brook
225	15,702	580	3 and 2	4	2	.....	Meadow Holm Jennie King
236	12,768	499	3	3	6	.....	Meadow Holm Jennie King
230	13,543	497	3	.....	.....	.....	Meadow Holm Jennie King
256	12,921	476	3	4	10	C	Meadow Holm Jennie King
216	15,133	573	3 and 2	4	6	.....	Marcella Heng. DeKol 6th
276	16,076	477	3	3	11	B	Marcella Heng. DeKol 6th
				Jerseys			
96	9,412	500	2	8	.....	A	Hambie's Experiment
105	8,186	445	2	7	5	AA	Hambie's Experiment
106	8,710	465	2	7	4	A	Hambie's Experiment
112	11,700	618	3	6	7	A	Hambie's Experiment
112	8,815	485	2	8	10	AA	Hambie's Experiment
119	10,768	614	3	6	5	AA	Hambie's Experiment
127	10,752	582	3	7	7	AA	Hambie's Experiment
143	10,149	580	3	4	6	A	Hambie's Experiment
173	8,026	483	3	5	8	AA	Hambie's Experiment
128	10,860	582	3	8	10	A	Bessie's Lad of the Campus
147	9,630	508	3	6	11	AA	Bessie's Lad of the Campus
159	8,728	516	2	4	3	AA	Bessie's Lad of the Campus
162	10,325	564	3	4	8	A	Bessie's Lad of the Campus
215	7,668	441	2	2	4	AA	Bessie's Lad of the Campus
215	10,819	596	3 and 2	4	6	A	Bessie's Lad of the Campus
215	8,437	438	2	5	11	AAA	Bessie's Lad of the Campus
215	10,091	535	2	7	.....	AA	Bessie's Lad of the Campus
215	14,903	754	3	8	1	AA	Bessie's Lad of the Campus
231	7,324	456	3	3	.....	A	Wooster Hambie
231	10,356	604	2	4	5	A	Wooster Hambie
231	11,553	670	3	6	5	AAA	Wooster Hambie
248	7,929	515	3 and 2	2	7	A	Choice Owl
257	7,800	465	2	2	10	AA	Choice Owl
265	7,624	395	2	2	2	A	Choice Owl
271	6,289	353	2	2	.....	AAA	Choice Owl
271	8,134	478	2	3	4	AA	Choice Owl
271	7,695	433	2	4	6	AAA	Choice Owl
281	6,322	377	2	2	7	A	Choice Owl
283	6,986	414	2	2	3	A	Choice Owl
283	7,022	409	2	3	7	AAA	Choice Owl
311	6,250	316	2	2	7	AA	Choice Owl
310	7,750	413	2	2	4	AA	Choice Owl
307	6,396	332	2	2	6	AAA	Choice Owl
274	7,852	439	2	4	4	A	Choice Owl
299	7,589	418	2	3	7	AAA	Choice Owl
314	8,501	437	2	2	4	AA	Maplewood Int. Owl

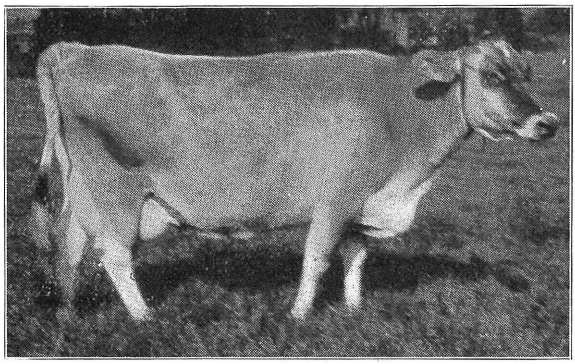


Fig. 7.—Bessie's Bessie Nervilette, 440701, Gold Medal cow

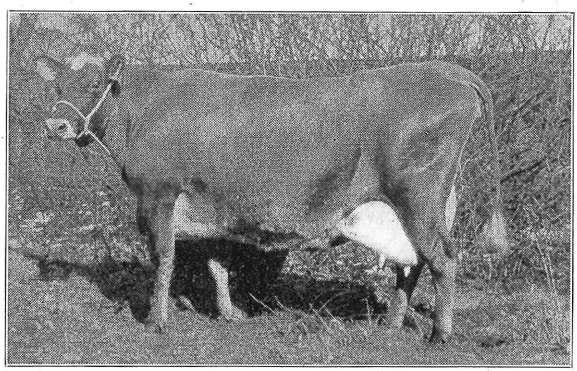


Fig. 8.—Wooster Lady, 477037, Gold Medal cow, State Champion in all 305-day classes in 1927

TOLERANCE OF CALVES FOR FORMALIN

Dairymen who sell whole milk might desire to save the milk not taken by the calf during the first few days for feeding to the calf later. It might be desirable to hold skimmilk for a few days to feed calves. Formalin is one of the most effective preservatives known for keeping milk sweet; also it is often used as a remedy in treating for scours. To determine how much can be used with safety, calves are being fed milk containing varying amounts of formalin.

BUTTERFAT TESTS IN FIRST AND LATER LACTATIONS

Dairymen frequently ask if a cow's test during her first lactation can be taken as an indication of her test in later years. The records of all cows that have been in milk in the Station herd more than one year show very little change in the test from year to year. There is a slight reduction of the test as the cow grows older, but only slight. The butterfat test in the first lactation is a very good indication of the test that can be expected as an average test of the cow for the rest of her milk-producing lifetime. This information is given in Bimonthly Bulletin for Mar.-Apr., 1927.

CERTAIN VITAMINS IN MILK

In cooperation with the Animal Industry Department, milk has been shown to be an excellent source of the vitamin which prevents pellagra, and a relatively poor source of the vitamin which prevents polyneuritis. This study also shows that a combination of milk and cereal foods adequately cares for the factors now known to be present in vitamin B.

EXPERIMENTS COMPLETED AND REPORTED DURING RECENT YEARS

SPRAYING COWS FOR FLIES

During the summer of 1926 and 1927 fly spraying experiments were conducted on a part of the Station herd. Altho the sprays used proved effective in reducing the number of flies on the cows, milk production was not apparently affected. The decline in milk production so frequently noticed in the months of July and August is no doubt largely due to atmospheric conditions and the drying-up of pastures. Hence, from the standpoint of milk production, fly-sprays may be disappointing, but they do add to the cow's comfort and the milker's peace of mind.

An effective spray can be made by mixing together 10 parts of fish oil and 5 parts each of oil of tar and Liquor Cresolis Compositus or other saponified cresol compound. This mixture is then diluted with five times its bulk of kerosene. This spray when applied after the morning milking was still effective in the evening. It must be applied lightly in a fine mist or blistering might occur.

MINERAL METABOLISM OF COWS

In everyday language this refers to a study of the use made by the dairy cow of the ash ingredients in the ration. In this work it is necessary to know just how much of each mineral element is supplied in the ration and how much is secreted in the milk and in the urine and feces. The difference between intake and outgo is called the balance. If the intake is larger than the outgo, the animal is said to be in positive balance, or storing that particular mineral. If the outgo exceeds the intake, the animal is said to be in negative balance, or losing the mineral. Such work requires the careful weighing and analyzing of all feeds given the cow during the test and also the quantitative collection and analysis of the milk, urine, and feces.

Four such experiments have been conducted by the Dairy Department on milking cows. The most important findings can be briefly stated as follows:

1. Holstein cows while producing from 30 to 38 pounds milk per day showed but slight losses of calcium and phosphorus, under the conditions of our experiments. One cow producing 52 pounds of milk per day was not losing calcium at an alarming rate.

2. The amount of clover hay in the ration affected the calcium balance. Those animals which received the larger amounts of clover had more favorable balances, that is, they lost less calcium, or stored more.

3. Cows that had been on pasture up to 8 weeks previous lost calcium and phosphorus more rapidly when placed on the experimental ration of rather low mineral content than did cows which had received these rations for some years.

4. Lime in natural water supplied the cows was apparently not utilized, as the cows showed just as favorable balances when they received distilled water, which contained no lime.

5. Beet pulp supplied 50 percent of the calcium in some of the rations and judging by the calcium balances it was well utilized. Beet pulp contains more than twice as much calcium as timothy hay. Reported in Bimonthly Bulletin for March-April, 1925, and Bulletin 376.

SILAGE CORN VS. FIELD CORN FOR SILAGE

Five successive tests in five years were made to determine the relative merits of the two types of corn for silage. The two varieties used were Clarage field corn and Blue Ridge ensilage corn. They were grown in alternate strips in the same field, planted at the same time and treated alike. The Clarage corn was ensiled an average of 21 days earlier than the Blue Ridge. The Blue Ridge averaged only .96 ton more per acre when reduced to the same dry-matter basis. The average difference in the dry matter of the two kinds of silage was only 1.9 percent. The Clarage outyielded the Blue Ridge one year. The Clarage silage contained about 15 percent more grain than the other.

The cows produced 15 pounds more milk per ton on the Blue Ridge silage but gained considerably less in weight. Much less difference was found than was commonly believed to exist. Reported in Bulletin 369.

LOSSES FROM GRAIN STORED IN THE SILO

Rather large losses from the grain in silage are commonly suspected. This work was an attempt to determine the extent and nature of the loss.

Analyses showed that much of the protein from the kernels, especially the broken kernels, was hydrolyzed and distributed thruout the silage. It is not lost unless there is leakage of juice from the silo. Therefore, corn for the silo should be cut at such a stage of maturity as will give enough moisture to preserve the silage well, but not enough to cause leakage from the silo. The riper corn should be placed in the bottom of the silo. The height of the silo influences the loss of juice. Reported in Bulletin 370.

SOYBEAN HAY AND ALFALFA HAY FOR MILK PRODUCTION

In two tests in which soybean hay was substituted for corn stover in a ration with cottonseed meal and bran, 8.7 pounds of the soybean hay appeared to give as good results in milk production as 7 pounds of stover reinforced with about 2.8 pounds of bran and 1.95 pounds of cottonseed meal. The cost of production was slightly less with the soybean ration.

In a third test, a ration containing alfalfa hay, corn, and corn silage was fed in comparison with one containing corn stover, corn silage, bran, and cottonseed meal. The two rations gave about equal results, indicating that alfalfa can take the place of a considerable amount of protein concentrates. Reported in Bulletin 267.

CLOVER VS. ALFALFA HAY

Tests conducted during three winters did not reveal as much difference between clover and alfalfa as was commonly believed. These legumes, together with a fair grain mixture, which was the same in each lot, gave about equal results; and the following conclusions were drawn: Alfalfa appears to be a better appetizer than clover; when the hays are of equal quality, alfalfa can not be said to be greatly superior to clover for milk production; alfalfa showed a stronger tendency to maintain the weight of the animal. Less feed protein was used by the cow in the clover ration per 100 pounds of milk than in the alfalfa ration. Reported in Bulletin 327.

SOYBEANS FOR MILK PRODUCTION

Two lots of four cows each were used in comparing ground soybeans and linseed oilmeal.

The ration consisted of corn silage, mixed hay, and a grain mixture of equal parts of corn, oats, and ground soybeans or linseed oilmeal. One lot received the soybeans and the other lot the linseed oilmeal. The data show that the cows of each lot ate about 3.25 pounds daily of the beans and oilmeal, respectively, over a period of 18 weeks. The data for 14 weeks were taken for comparison. The difference was so small that the results may be considered equal.

A comparison of soybean oilmeal with linseed oilmeal was made. Six cows were used in the test, January to May 31. The rations were the same as in the previous test, except that the ground soybeans were replaced by soybean oilmeal.

The soybean ration produced 1.9 percent more milk and 3.6 percent more fat than the linseed-oilmeal ration, a very small difference. Slightly more feed was consumed with linseed oilmeal than with soybean oilmeal.

Reported in Bimonthly Bulletin, July-August, 1926.

SOYBEAN HAY AND SOYBEAN SILAGE

Two groups of cows were fed from November 28 to April 18, in a comparison of soybeans mixed with corn in the silo and soybeans used as hay. Both groups received the same grain mixture. One group received soybean hay and corn silage, and the other corn—soybean silage. The data used for comparison covered a period of 14 weeks and show very little difference in favor of the silage.

The dry matter in the 4,686 pounds of soybean silage was about equal to the dry matter in 2,254 pounds of the soybean hay. Reported in Bimonthly Bulletin, Sept.-Oct., 1926.

GROWING DAIRY HEIFERS

This is a study of the feeding records of 69 heifers to one year of age, 51 to 2 years, and 37 to calving time, and includes the feeds consumed and the costs at the time the work was done (1915), compared with costs at other stations. The reader can calculate the present cost from the feeds consumed and local prices.

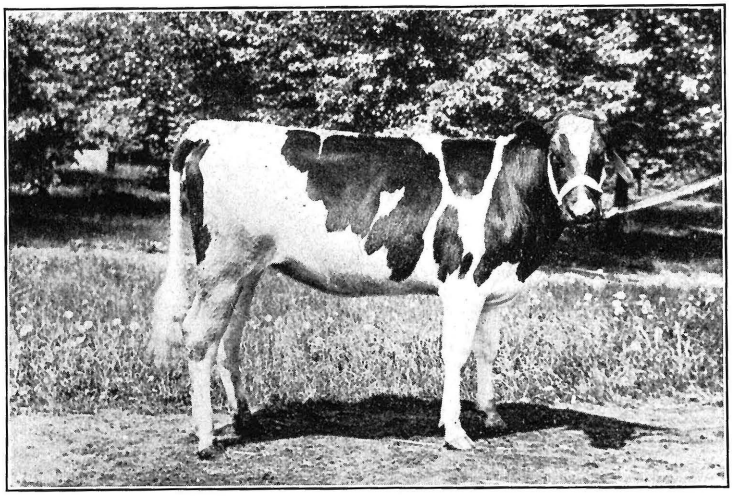


Fig. 9.—A well grown heifer

The high cost emphasizes the fact that only the best should be raised. Published as Bulletin 289, 1915.

TABLE 3.—Feeds Consumed

	Wholemilk	Skimmilk	Grain	Silage	Hay	Stover	Pasture
			Jerseys				
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
First year	465	2,928	597	458	709	40	122
Second year	.....	.....	785	2,426	1,038	254	159
Two years	465	2,928	1,382	2,884	1,747	294	281
			Holsteins				
First year	499	2,786	656	586	768	29	128
Second year	.....	.....	870	2,247	1,419	232	151
Two years	499	2,786	1,526	2,833	2,187	261	279

DAIRY PUBLICATIONS OF THE EXPERIMENT STATION, WOOSTER, OHIO

BULLETINS

267, The value of soybean and alfalfa hay in milk production.
289, Raising dairy heifers, cost, feeding, and care.
327, Clover vs. alfalfa hay for milk production.
334, Dairy production in Ohio.
295, 308, 330, and 363, Mineral metabolism of the milch cow.
347, Utilization of calcium compounds in animal nutrition.
369, Field corn and silage corn for silage.
370, Losses and exchanges of material during the storage of corn as silage.
376, The effect of high and low protein content on the digestibility and metabolism of dairy rations.
389, Protein requirement of dairy cows.

CIRCULARS

122, Testing the dairy cow.
128, Feeding dairy cows.
134, The care of cream.
135, Building up the dairy herds of Ohio.
136, Care of the dairy herd.

MONTHLY BULLETINS

Feb. 1916, Beets and mangels compared with silage for milk production.
May 1916, Heavy silage vs. heavy grain feeding for dairy cows.
July 1916, Influence of dairy sires on production.
Aug. 1916, Does it pay to take extra care of cows?
Oct. 1916, Variations in the composition of skimmilk.
Dec. 1916, Misguided appetite and the high cost of living (Food value of milk).
Jan. 1917, Feeding situation (Winter dairy rations).
Feb. 1917, Low grade cottonseed meal.
June 1917, Cost of milk production.
Sept. 1917, Raising dairy heifers, costs.
Oct. 1917, Economy of production by dairy cows.
Nov. 1917, Nutrients returned by dairy cows.
Dec. 1917, Stage of lactation affects milk yield.
Dec. 1917, Roughages for milk production.
Apr. 1918, A neglected source of valuable human food (Cottage cheese, food value, manufacture, and sale).
Oct. 1918, Manurial value of dairy feeds.
Dec. 1918, How to determine the cost of milk—I.
Dec. 1918, Centrifugal recovery of cheese from buttermilk.
Jan. 1919, How to determine the cost of milk—II.
July 1919, Ohio Experiment Station dairy herd.
Sept. 1919, Recovering cottage chesse curd from buttermilk.
Oct. 1919, Home mixed or proprietary feeds for the dairy herd.

Dec. 1919, Usefulness of production records in dairy management.
Sept. 1921, Crop rotations for a dairy farm.
Apr. 1922, A case of twinning in dairy cattle.
Dec. 1922, May 1923, Raising and feeding dairy steers.
Dec. 1923, Abnormal fermentation in milk (ropy milk).

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March-April, 1925, Minerals in the dairy ration.
May-June, 1925, Selecting foundation dairy cows.
July-Aug., 1925, Alfalfa and clover hay for dairy heifers.
Jan.-Feb., 1926, A dairy cow, Grace Daw 2d, and her progeny.
May-June, 1926, Alfalfa and soybean hay for growing heifers.
July-Aug., 1926, Soybeans and soybean oilmeal for milk production.
Sept.-Oct., 1926, Soybean hay and soybean silage.
Nov.-Dec., 1926, Liberality and economy in feeding of dairy cows.
March-April, 1927, Butterfat tests of first and later lactations.
Jan.-Feb., 1928, Hay for dairy cattle.
March-April, 1928, Effect of high and low protein rations on milk for calves.
March-April, 1928, Succulent Dairy Feeds.
May-June, 1928, High protein grains supplement to pasture for dairy cows.
May-June, 1928, Gold medal cows in station dairy herd.
July-Aug., 1928, The possibility of producing iodized milk.
Sept.-Oct., 1928, A study of certain processes for fermenting or enzymatizing feeds (on the press).

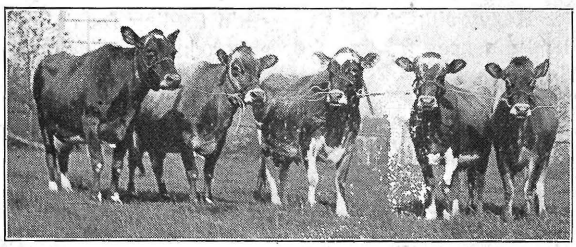

Fig. 10.—A Jersey dam and four good daughters